

Serial No. 10/621,627, filed 7/17/2003

Amendments to Specification:

Please amend paragraph 1 as follows:

- [1] This invention relates to a wheel end condition detection system using an anti-lock braking system (ABS) for identifying a potentially hazardous condition in which a ~~the~~-wheel may undesirably separate from ~~the~~ an axle during vehicle operation.

Please amend paragraph 2 as follows:

- [2] Wheel ends including one or more wheels and tires are supported on opposing ends of an axle. Wheel ends are supported by bearings on a hub of the axle. On rare occurrences, one of the components associated with the wheel end may wear or fail, or the wheel end may be improperly installed, and the wheel end may begin to move laterally relative to the axle. Excessive lateral movement may cause the wheel end to become detached from the axle during vehicle operation creating a dangerous condition.

Please amend paragraph 6 as follows:

- [6] This invention provides a vehicle axle assembly including a wheel end supported on an axle by bearings. The wheel end may include a tone ring or similar device associated with ~~the~~ a hub of the wheel end. A sensor may be mounted on the axle by a bracket. The sensor is located proximate to the tone ring to detect rotation of the wheel end to modulate braking of the wheel end. The ABS may also detect lateral movement of the wheel end relative to the axle using the sensor and tone ring. A fault code is generated during excessive lateral movement of the wheel end relative to the axle. In an example embodiment, the present

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invention wheel end condition detection system may activate a warning device in the vehicle cab in addition to illuminating an ABS warning light to communicate the severity of the condition to the vehicle operator. Additionally, the detection system may also communicate with a vehicle control system to limit the vehicle speed by regulating the engine to ensure that the vehicle is not operated at an unsafe speed until the wheel end condition is corrected.

Please amend paragraph 11 as follows:

- [11] A vehicle axle assembly 10 is schematically shown in Figure 1. The assembly 10 includes an axle 12 having a spindle 14. The wheel end assembly 15 includes a hub 16 supported on the spindle 14 by bearings 18. A wheel 20 is secured to the hub 16 by fasteners, and the wheel 20 supports a tire 22 for rotation about an axis A. The wheel end assembly 15 is retained on the axle 12 by a nut 19 or any other suitable configuration, as is known in the art.

Please amend paragraph 13 as follows:

- [13] The vehicle axle assembly 10 also includes an ABS assembly 24, as is well known in the art, for detecting the rotation of the wheel end assembly 15 for use during braking and other vehicle maneuvers. The ABS assembly 24 may include a tone ring 26 associated with the wheel end assembly 15. For example, the tone ring 26 may be mounted onto the hub 16 for rotation with the hub 16. The tone ring 26 may include notches about its circumference that indicate the wheel end rotational speed and other information, as is known in the art. The ABS assembly 24 includes a sensor 28 mounted on the axle 12 by a bracket 30. The sensor 28 is mounted proximate to the tone ring 26 to detect the rotation of the wheel end assembly 15 by magnetically "reading" the notches as they pass the ~~senor~~ sensors 28, as is known in the art.

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Please amend paragraph 14 as follows:

- [14] An ABS controller 32 is connected to the sensor 28 for detecting information useful for the ABS and other vehicle control systems. For example, the ~~ABS control controller system~~ 32 may detect excessive lateral movement of the wheel end assembly 15 relative to the axle 12 and trigger a fault code indicating that the sensor 28 is out of lateral alignment with the tone ring 26. Excessive lateral movement may be evident from a deteriorating electrical signal from the sensor 28, for example. The ABS controller 32 may activate an ABS warning device 34 in the vehicle cab 35, such as illuminating an ABS warning light. The ABS controller 32 may be integrated with other ~~systems~~ system controllers.

Please amend paragraph 15 as follows:

- [15] The ABS warning light is intended to prompt the vehicle operator to seek a service or maintenance technician to correct the ABS. However, the ABS warning device ~~32~~ 34 typically does not convey the urgency of the problem within the ABS, and therefore, the vehicle may operator may continue to drive the vehicle until a failure occurs, for example, until the wheel end assembly 15 becomes detached from the axle 12. To this end, this invention incorporates additional warning devices and controls to ensure sufficient warning to the vehicle operator and continued safe operation of the vehicle until the ABS is properly serviced.

Please amend paragraph 16 as follows:

- [16] Excessive lateral movement of the wheel end assembly 15 relative to the axle 12 may occur, for example, as a result of failing bearings 18. In the case of a unitized bearing, the bearing failure may not be apparent to the vehicle operator or service technician. The sensor 28 detects excessive lateral movement of the wheel end in the direction X as the tone ring 26 moves laterally relative to the sensor 28. When the lateral movement X reaches a ~~pre-determined~~ predetermined value, the ABS controller 32 will register a fault code and illuminate a conventional ABS warning device 34, such as an ABS warning light in the vehicle cab 35.

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Instead of, or in addition to the warning device 34, the ABS controller 32 may also activate a wheel end condition warning device 36 in the vehicle cab 35. The wheel end condition warning device 36 may be an audio and/or visual warning that conveys a clear message to the vehicle operator as to the nature and severity of the wheel end condition. As a result, the vehicle operator will more likely seek prompt service of the ABS.